Do-more H2 Series PLC Overview

Do-more H2 Series PLC Modules

The Do-more H2 Series PLC is the newest technology available that makes control applications easier to implement. It uses proven DirectLOGIC hardware as a platform for a powerful, flexible instruction set, with a user-friendly programming environment. The Do-more H2 Series PLC utilizes most of the modules that are part of the DL205 PLC family. You simply install a Do-more H2 Series CPU module into a DL205 base unit. However, the specifications of the Do-more H2 Series PLC are very different from the DL205 PLC. This overview covers the key features of the Do-more H2 Series PLC.

Do-more H2 CPU Module

DL205 PLC base unit and I/O modules

CPU modules

The Do-more H2 Series PLC offers two CPU modules available, H2-DM1 and H2-DM1E, both of which must be programmed using the Do-more Designer programming software. You cannot use the existing DL205 CPU modules (D2-230, D2-240, D2-250(-1) and D2-260) with Do-more Designer.

H2-DM1

H2-DM1E (with Ethernet)

Base units

The Do-more H2 Series PLC supports all of the base units available for the DL205 PLC.

Do-more H2 Series PLC Overview

Discrete I/O modules

The Do-more H2 Series PLC supports all of the discrete I/O modules available for the DL205 PLC.

Analog I/O modules

The Do-more H2 Series PLC supports all of the analog I/O modules available for the DL205 PLC.

Do-more H2 Series PLC Overview

Specialty modules

The Do-more H2 Series PLC supports many of the specialty modules available for the DL205 PLC. The following modules are supported:

H2-ECOM100

H2-SERIO

H2-SERIO-4

H2-ERM

H2-CTRIO

H2-CTRIO2

F2-08SIM

Specialty modules NOT supported

The following modules are NOT supported by the Do-more H2 Series PLC.

D2-DCM

D2-RMSM

D2-CTRINT

F2-CP128

D2-EM

D2-CM

D2-RSSS

DV-1000

D2-HPP

Programming Software

The Do-more H2 Series PLC can only be programmed by Do-more Designer. (DirectSOFT programming software is not compatible with Do-more PLCs)

Do-more H2 Series PLC Overview

Module Compatibility

The following table shows which DL205 components are supported by the H2-DM1 and H2-DM1E Do-more CPUs.

Module Compatibility Table					
Module	**Part Number**	**Status**	**Module**	**Part Number**	**Status**
Base Units	D2-03B-1	✓	***Analog I/O Modules***	F2-04AD-1	✓
	D2-04B-1	✓		F2-04AD-2	✓
	D2-06B-1	✓		F2-08AD-1	✓
	D2-09B-1	✓		F2-08AD-2	✓
	D2-03BDC1-1	✓		F2-04RTD	✓
	D2-04BDC1-1	✓		F2-04THM	✓
	D2-06BDC1-1	✓		F2-02DA-1(L)	✓
	D2-09BDC1-1	✓		F2-02DA-2(L)	✓
	D2-06BDC2-1	✓		F2-02DAS-1	✓
	D2-09BDC2-1	✓		F2-02DAS-2	✓
Discrete I/O Modules	D2-08ND3	✓		F2-08DA-1	✓
	D2-16ND3-2	✓		F2-08DA-2	✓
	D2-32ND3	✓		F2-4AD2DA	✓
	D2-32ND3-2	✓		F2-8AD4DA-1	✓
	D2-08NA-1	✓		F2-8AD4DA-2	✓
	D2-08NA-2	✓	***Local Expansion Modules***	D2-CM	No
	D2-16NA	✓		D2-EM	No
	D2-04TD1	✓	***Specialty Modules***	H2-ERM	✓
	D2-08TD1	✓		H2-ERM-F	✓
	D2-08TD2	✓		D2-RMSM	No
	D2-16TD1-2	✓		D2-RSSS	No
	D2-16TD2-2	✓		H2-ECOM100	✓
	F2-16TD1P	✓		H2-ECOM-F	✓
	F2-16TD2P	✓		D2-DCM	No
	D2-32TD1	✓		H2-EBC100	✓
	D2-32TD2	✓		H2-EBC-F	✓
	D2-08TA	✓		H2-SERIO	✓
	F2-08TA	✓		H2-SERIO-4	✓
	D2-12TA	✓		F2-CP128	No
	D2-04TRS	✓		H2-CTRIO	✓
	D2-08TR	✓		H2-CTRIO2	✓
	F2-08TR	✓		D2-CTRINT	No
	F2-08TRS	✓		F2-08SIM	✓
	D2-12TR	✓	***Programmer***	D2-HPP	No
	D2-08CDR	✓	***Operator Interface***	DV-1000	No

✓ = Supported No = Not Supported

Do-more H2 Series PLC Overview

Communications

The Do-more H2 Series PLC supports many communication protocols. The following table shows which CPU module communications port or specialty module supports each protocol.

Protocols	CPU Modules			Specialty Modules			
	H2-DM1 / H2-DM1E		H2-DM1E	H2-ECOM100	H2-ECOM H2-ECOM-F	H2-SERIO H2-SERIO-4	H2-ERM H2-ERM-F
	USB Port	RS-232 Serial Port	Ethernet Port				
Do-more Designer Programming	Yes	Yes	Yes	Yes		Yes	
Modbus/RTU Client (Master)		Yes				Yes	
Modbus/RTU Server (Slave)		Yes				Yes	
Modbus/TCP Client (Master)			Yes	Yes			
Modbus/TCP Server (Slave)			Yes	Yes			
DirectLOGIC RX/WX Client (Master)			Yes	Yes	Yes		
DirectLOGIC RX/WX Server (Slave)			Yes	Yes	Yes		
K-Sequence Server (Slave)		Yes		Yes	Yes	Yes	
DirectNET Server (Slave)				Yes	Yes		
HEI Ethernet Remote I/O Master							Yes
SMTP (EMail) Client w/Authentication			Yes				
Simple Network Time Protocol (SNTP) Client			Yes				
Do-more/PEERLINK			Yes				
Do-more Time Synchronization Protocol (Client, Server, Alternate Client)			Yes				
Do-more Logger/UDP			Yes				
Serial ad-hoc ASCII/Binary Programatic Control		Yes				Yes	
UDP ad-hoc Programmatic Control			Yes				
TCP Client Programmatic Control			Yes				
TCP Server Programmatic Control			Yes				

Blank = Not Supported

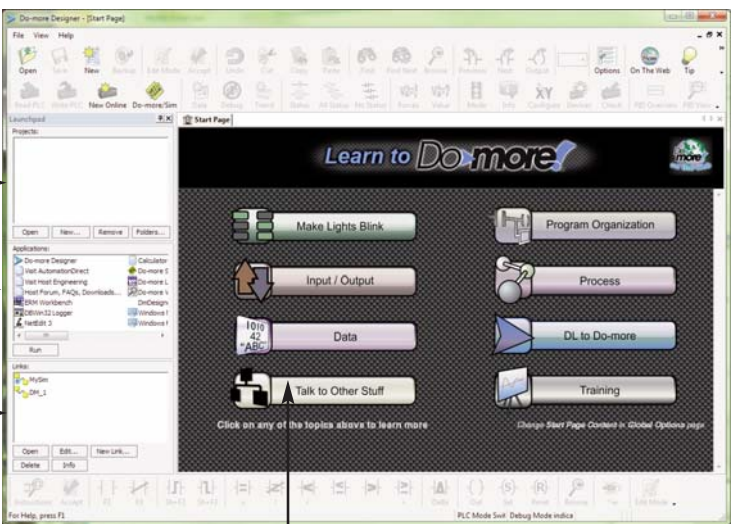
Do-more H2 Series PLC Overview

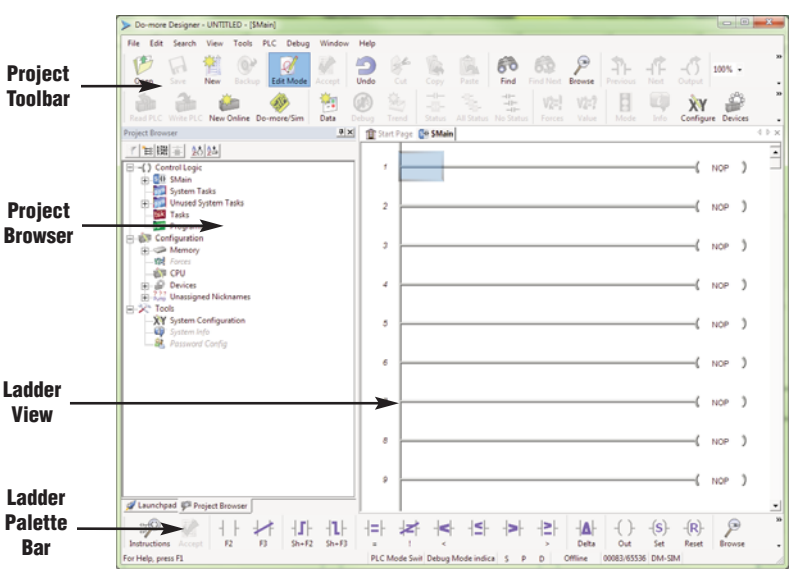
Do-more Designer (Part No. DM-PGMSW)

Do-more Designer is the full-featured programming software for the Do-more PLC series. Do-more Designer is a free download from Automationdirect.com. A CD-ROM version is also available for purchase.

Start Page

When the software is started, the Start Page is displayed. This page contains a Launchpad with Projects, Applications and Links windows. It also contains shortcuts to important help file topics and the Do-more Simulator.





Main Programming Window

The Main Programming Window is displayed when a new program is started or an existing program is opened. It is divided into Menus, Toolbars, and Windows that work together to make project development as simple as possible.

Do-more H2 Series PLC Overview

Do-more Designer Features

Do-more Designer has the following main features:

- Supports the Do-more PLC instruction set
- Project Browser (Window to organize the user project)
- Data View (Interface to monitor PLC data in a list)
- Trend View (Interface to monitor PLC data with trend graphs)
- PID View (Interface to monitor and tune the individual PID control loop)
- PID Overview (Interface to monitor multiple PID control loops)
- Debug View (Interface to debug the ladder programs)

When Do-more Designer is installed on your PC, the following tools are also installed:

- Do-more Simulator (Offline simulator of ladder program execution and PID control)
- Do-more Logger (Software tool to log PLC data)
- ERM Workbench (Configuration tool for the ERM modules)
- NetEdit 3 (Configuration tool for the ECOM/EBC Ethernet modules)

PC Requirements

The Do-more Designer Windows-based programming software works with Windows® XP (Home or Professional, 32-bit), Vista (Home, Basic, Premium, 32 or 64-bit) or Windows 7 (Home, Professional, Ultimate, 32 or 64-bit). Please check the following requirements when choosing your PC configuration:

- Minimum PC to PLC Connectivity, at least one of the following:
  - USB Port: connects to the CPU with USB-A connector (USB-A to USB-B cable)
  - RS-232 Serial Port: connects to the CPU with RJ-12 connector (RJ-12 to DB9 or RJ-12 to USB-B serial converter cable)
  - Ethernet Port: connects to the CPU (H2-DM1E) with RJ-45 10Base-T or 100Base-T (Cat5 Patch Cable)
- Hard Disk: 100MB free disk space
- Video Display: 1024x768, 256 colors resolution (1280x720, true color recommended)
- Windows XP, 32-bit:
  - 800MHz, single core CPU (2GHz, multi-core or hyperthreaded recommended)
  - 512MB RAM (2GB recommended)
- Vista or Windows 7, 32 or 64-bit:
  - 1GHz, single core CPU (2GHz, multi-core recommended)
  - 1GB RAM (3GB recommended)

Programming Cables

The Do-more H2 Series CPU module H2-DM1 has two communication ports (USB and RS-232 serial) and the H2-DM1E has three communication ports (USB, RS-232 serial and Ethernet). You can use any of those ports for programming and monitoring. Needed cables for these ports are listed below and can be purchased at Automationdirect.com.

USB Cables (USB 2.0, Type A-B connectors) available:

- USB-CBL-AB3 (3 ft.)
- USB-CBL-AB6 (6 ft.)
- USB-CBL-AB10 (10 ft.)
- USB-CBL-AB15 (15 ft.)

RS232 Serial Cable

- D2-DSCBL (12 ft. 9-pin D-sub to RJ12 connector)

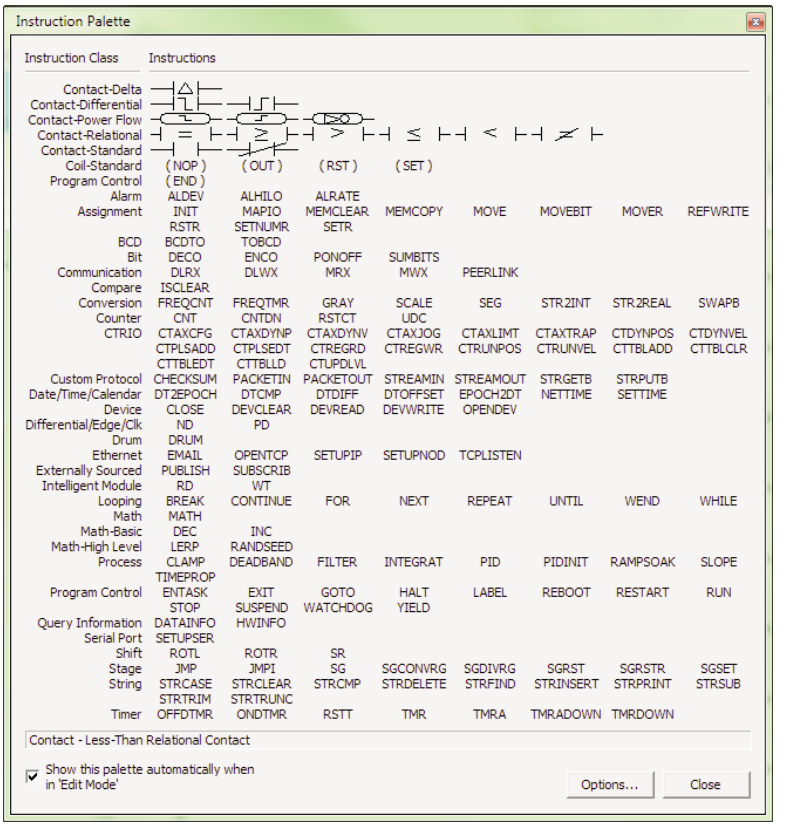
Ethernet Cables (Cat5e)

Automationdirect.com sells many Ethernet patch cables in various colors and lengths. Please check the Cables section in this catalog for further details.

Do-more H2 Series PLC Overview

Do-more PLC Instruction Set

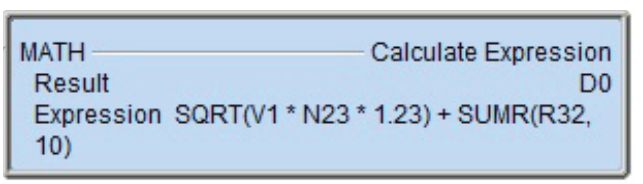
This Instruction Set was developed specifically for the new Do-more PLC; the 'Instruction Palette' displays all available instructions.


Instruction Palette
Instruction Class
Instructions
Contact-Delta
Contact-Differential
Contact-Power Flow
Contact-Relational
Contact-Standard
Coil-Standard (NOP) (OUT) (RST) (SET)
Program Control (END)
Alarm ALDEV ALHILO ALRATE
Assignment INIT MAPIO MEMCLEAR MEMCOPY MOVE MOVEBIT MOVER REFWRITE
RSTR SETNUMR SETR
BCD BCDTO TOBCD
Bit DECO ENCO PONOFF SUMBITS
Communication DLRX DLWX MRX MWX PEERLINK
Compare ISCLEAR
Conversion FREQCNT FREQTMR GRAY SCALE SEG STR2INT STR2REAL SWAPB
Counter CNT CNTDN RSTCT UDC
CTRIO CTAXCFG CTAXDYNP CTAXDYNV CTAXJOG CTAXLIMT CTAXTRAP CTDYNPOS CTDYNVEL
CTPLSADD CTPLSEDT CTREGRD CTREGWR CTRUNPOS CTRUNVEL CTTBLADD CTTBLCLR
CTTBLEDT CTTBLLD CTUPDLVL
Custom Protocol CHECKSUM PACKETIN PACKETOUT STREAMIN STREAMOUT STRGETB STRPUTB
Date/Time/Calendar DT2EPOCH DTCMP DTDIFF DTOFFSET EPOCH2DT NETTIME SETTIME
Device CLOSE DEVCLEAR DEVREAD DEVWRITE OPENDEV
Differential/Edge/Clk ND PD
Drum DRUM
Ethernet EMAIL OPENTCP SETUPIP SETUPNOD TCPLISTEN
Externally Sourced PUBLISH SUBSCRIB
Intelligent Module RD WT
Looping BREAK CONTINUE FOR NEXT REPEAT UNTIL WEND WHILE
Math MATH
Math-Basic DEC INC
Math-High Level LERP RANDSEED
Process CLAMP DEADBAND FILTER INTEGRAT PID PIDINIT RAMPSOAK SLOPE
TIMEPROP
Program Control ENTASK EXIT GOTO HALT LABEL REBOOT RESTART RUN
STOP SUSPEND WATCHDOG YIELD
Query Information DATAINFO HWINFO
Serial Port SETUPSER
Shift ROTL ROTR SR
Stage JMP JMPI SG SGCONVRG SGDIVRG SGRST SGRSTR SGSET
String STRCASE STRCLEAR STRCMP STRDELETE STRFIND STRINSERT STRPRINT STRSUB
STRTRIM STRTRUNC
Timer OFFDTMR ONDTMR RSTT TMR TMRA TMRADOWN TMRDOWN
Contact - Less-Than Relational Contact
Show this palette automatically when in 'Edit Mode'
Options...
Close

You may see some similarities to the DirectLOGIC PLC instruction set. However, the instruction set for the Do-more PLC is more advanced and intuitive. A good example is the MATH instruction. Now, just one MATH instruction covers all math operations and also allows you to mix different data types in one expression.

There are over 60 operators and functions available with the MATH instruction.

Note: To learn more about the MATH instruction, please refer to the Do-more Designer help topic 'MATH – Math Expression'.



Operators

+, -, *, /, %, **, <, <=, ==, !=, >=, >, &&, ||, &, |, ^, <<, >>, >>>, -, ~, !

Functions

ABS, ACOS, ASIN, ATAN, AVGR, COS, COUNTIFEQ, COUNTIFNE, COUNTIFGE, COUNTIFGT, COUNTIFLE, COUNTIFLT, DEG, E, FRAC, IF, LN, LOG, MAXR, MAX, MINR, MIN, NOW, PI, RAD, RANDINT, RANDREAL, REF, ROUND, SIN, SQRT, STDEVR, STDEVPR, SUMIFEQ, SUMIFNE, SUMIFGE, SUMIFGT, SUMIFLE, SUMIFLT, SUMR, TAN, TICKms, TICKus, TOINT, TOREAL, TRUNC

Do-more H2 Series PLC Overview

Data Types

The Do-more PLC supports the following seven primary data types:

- Bit (0 or 1)
- Unsigned Byte (0 to 255)
- Signed Byte (-128 to 127)
- Unsigned Word (0 to 65,535)
- Signed Word (-32,768 to 32,767)
- Signed DWord (-2,147,483,648 to 2,147,483,647)
- Real (-3.4028235E+038 to 3.4028235E+038)

Note: As you can see, the BCD data type that is popular for the DirectLOGIC PLC is not included in this list. However, you can use the BCDTO and TOBCD instructions if you need to use the BCD data type with your application. Those instructions convert the data between the BCD data type and the integer/real data types.

Data Structure

The Do-more PLC supports data structures as additional data types. Structures use the familiar PC programming organization of "dot notation". All available elements of a structure are shown in this format. The following data structures are currently available:

- Timer Structure
- Counter Structure
- String Structure
- PID Structure
- Date/Time Structure
- Task Structure
- Rampsoak Structure
- Program Structure
- DeviceRef Structure
- Drum Structure

The data structure is a set of data. For instance, a Timer structure (Timer Struct) has the following set of data:

- Acc (Accumulated Time, Signed DWord)
- Done (Bit)
- Zero (Bit)
- Timing (Bit)
- Reset (Bit)

When you use a timer instruction (TMR), a Timer structure is assigned to the instruction. If you select 'T0', you can access the above data with dot notation. For instance, to access the accumulated time (Acc), enter 'T0.Acc'. To access the Done bit, enter 'T0.Done'.

Memory Addressing

With the Do-more PLC, each memory address type has its own specific data type. Here are some examples:

- V (Unsigned Word)
- N (Signed Word)
- D (Signed DWord)
- R (Real)

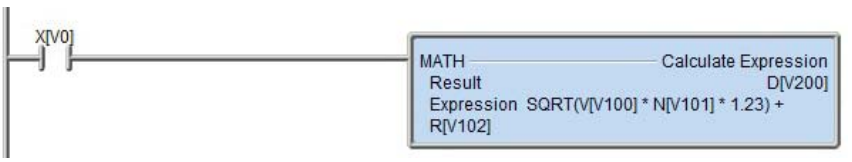
If you see address 'V123' in the ladder program, the memory address always stores an Unsigned Word value. With this memory addressing method, it becomes easier to read and write the ladder programs.

Although most of the memory addressing is decimal, the memory addresses DLX, DLY, DLC and DLV use octal. These four memory addresses can be used to exchange data with DirectLOGIC PLCs, which use octal memory addressing.

Do-more H2 Series PLC Overview

Array Addressing

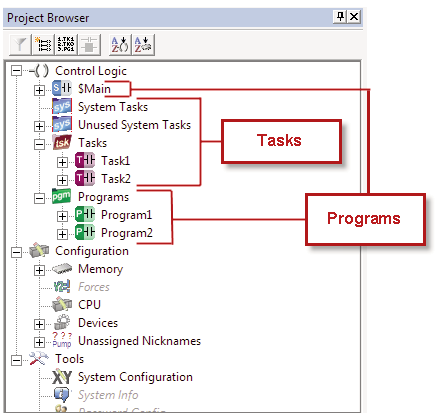
The Do-more PLC supports array addressing with all memory addresses. V-memory address must be used as the index for an array. With the Do-more PLC, the following ladder program is valid.



Note: In this example, V0, V100, V101, V102 and V200 are indices.

Code-block, Program and Task

One Do-more project can consist of more than one ladder program. Each ladder program is called a 'Code-block'. The Do-more PLC supports two types of code-blocks, Program and Task. Here are their definitions.



Program

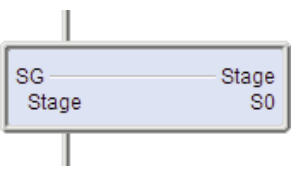
Programs are code-blocks that run based on an event using the RUN instruction. They can be self-terminating or never terminate. Stage programming is only supported inside Program code-blocks.

Task

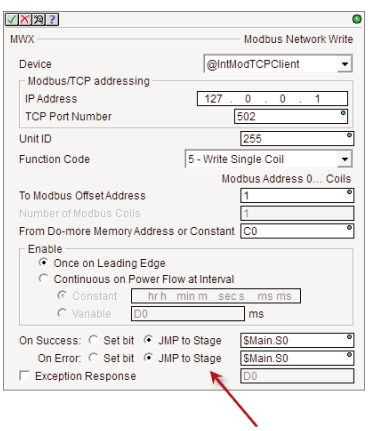
Tasks are code-blocks that are enabled and disabled using the ENTASK instruction. The ENTASK instruction allows you to specify an interval to execute the task's logic with a millisecond resolution or to execute a single time on a leading edge input.

Stages

The Do-more PLC supports Stages. You can use Stages only in the Program code-blocks. (They are not available in the Task code-blocks.) The Do-more PLC supports the following instructions for Stage Programming[1]:



- SG (SG)
- JMP (Jump To Stage)[2]
- JMPI (Index Jump)
- SGSET (Enable Stage)
- SGRST (Disable Stage)
- SGRSTR (Disable Range of Stages)
- SGCONVRG (Converge Multiple Stages to SG)
- SGDIVRG (Jump to Multiple Stages)



[1] There is no ISG (Initial Stage) instruction for the Do-more PLC; the first stage in the Program code-block becomes the initial stage automatically.

[2] Many asynchronous instructions can directly initiate a Jump to Stage.

Do-more H2 Series PLC Overview

Comparison with the DL205 PLC

The following spec table shows the major differences between the Do-more H2 Series PLC and the DL205 PLC.

	Do-more H2 Series PLC	DL205 PLC
Instruction Set	Do-more PLC instruction set	DirectLOGIC PLC instruction set
Total Memory Bytes	262.1K	30.4K
Default Data Type	Decimal and Real (Data can be referred in different data types with the 'Casting' feature.)	BCD, HEX and Real
Memory Addressing	Decimal mainly (There are some octal memory addresses to exchange data with DirectLOGIC PLCs easily.)	Octal
User-defined Memory Addresses	Yes	No
Bit of Memory	Available for all memory addresses (e.g. V100.2, D200.3)	Yes, D2-250(-1) and D2-260 only
Array Addressing	Available for all memory addresses (e.g. X[V100], D[V200])	Available only for V-memory addresses (e.g. P2000)
Math Calculation	No accumulator, the MATH instruction can support a mix of different data types.	Using accumulator or using the MATHBCD, MATHBIN or MATHR instruction for each data type.
Number of Code Blocks	1 system program 6 system tasks Up to 256 user programs Up to 256 user tasks	1
Looping	FOR-NEXT, WHILE-WEND, REPEAT-UNTIL	FOR-NEXT
Subroutines	No (Use Code-blocks)	Yes
User Document (Nicknames, Rung Comments…) Storing	Stored in the CPU module	No (Stored on PC only)
Password Protection	Multiple passwords	Single password
Run-time Editing	Bumpless	Ladder program execution is paused during the ladder program transfer in RUN mode.
Analog I/O Configuration	The X, WX and WY addresses are assigned to analog I/O channels automatically. (Manual addressing is available also.)	Configured by ladder program
Local Base Expansion	No	Yes (with D2-EM and D2-CM)
Number of PID Loops	Over 2000	4 (D2-250-1), 16 (D2-260)
Memory Back-up Battery	Included	Optional
Firmware Update	CPU module firmware can be updated from Do-more Designer.	Use firmware update tool
Built-in RS-232 Port	Yes, Full duplex	Yes, Half duplex
Built-in USB Port	Yes	No
Built-in Ethernet Port	Yes (H2-DM1E)	No
Programming Software	Do-more Designer	DirectSOFT

Dimensions and Installation

Understanding the installation requirements for your Do-more H2 Series PLC system will help ensure that the components operate within their environmental and electrical limits.

Plan for safety

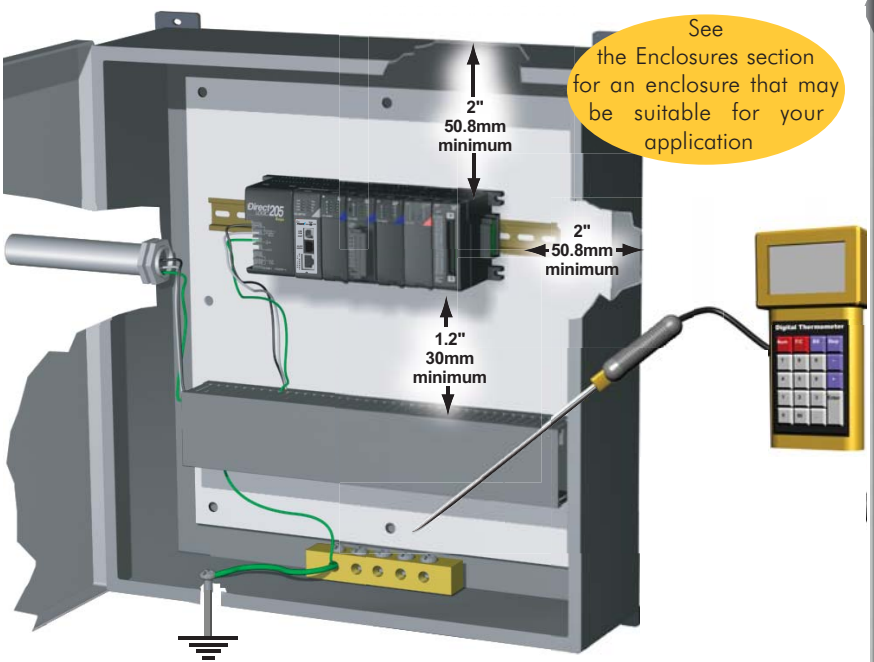
This catalog should never be used as a replacement for the user manual. The user manual, H2-DM-M (sold separately or downloadable online), contains important safety information that must be followed. The system installation should comply with all appropriate electrical codes and standards.

Environmental specifications

The Environmental Specifications table at the right lists specifications that apply globally to the Do-more H2 Series PLC system (CPUs, bases, and I/O modules). Be sure that the system is operated within these environmental specifications.

Base dimensions and mounting

Use the diagrams below to make sure the Do-more H2 Series PLC system can be installed in your application. To ensure proper airflow for cooling purposes, bases must be mounted horizontally. It is important to check these dimensions against the conditions required for your application. For example, it is recommended that approximately 3" of space is left in front PLC surface for ease of access and cable clearances. Also, check the installation guidelines for recommended cabinet clearances.



Environmental Specification	Rating
Storage Temperature	-4°F - 158°F (-20°C to 70°C)
Ambient Operating Temperature	32°F - 131°F (0°C to 55°C)
Ambient Humidity	30%-95% relative humidity (non-condensing)
Vibration Resistance	MIL STD 810C, Method 514.2
Shock Resistance	MIL STD 810C, Method 516.2
Noise Immunity	NEMA (ICS3-304)
Atmosphere	No corrosive gases

Base	A (Base Total Width)		B (Mounting Hole)		C (Component Width)	
	Inches	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*
3-slot	6.77”	172mm	6.41”	163mm	5.8”	148mm
4-slot	7.99”	203mm	7.63”	194mm	7.04”	179mm
6-slot	10.43”	265mm	10.07”	256mm	9.48”	241mm
9-slot	14.09”	358mm	13.74”	349mm	13.14”	334mm